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BULLETIN
OF THE
TORREY BOTANICAL CLUB

APRIL, 1916

Notes on species of *Halymenia*

F. S. COLLINS AND M. A. HOWE

In connection with studies of a series of specimens of red algae of the genus *Halymenia* from Bermuda, southern Florida, and North Carolina, we have been forced to recognize as entitled to specific rank four striking and apparently well-defined forms that we are venturing to describe as new. One of these is related to *Halymenia floridana* J. Ag., two find their closest affinity in *H. Floresia* (Clem.) Ag., and the fourth is allied to *H. actinophysa* M. A. Howe. Descriptions follow:

***Halymenia bermudensis* sp. nov.**

Thallo violaceo-rubro, plerumque stipitato; stipite inferne subtereti, superne complanato vel costato-alato, interdum ramoso, plus minusve elongato; fronde membranacea, firma, levi, nec nitente, 60–120 μ crassa, suborbiculari, cordata vel obovata, saepe, interdum repetite, lobata vel prolifera, divisionibus frondi primariae conformibus; margine plana vel plicata, subintegra, crenata, vel interdum irregulariter dentata; medulla frondis subcompacta, inter fila tenuiora filis crassioribus stellatim radiatis frequenter sparsis; strato corticali frondis series 1–3 cellularum minorum monstrante; strato subcorticali series 1–3 cellularum majorum monstrante; tetrasporangiis sparsis; cystocarpiis ignotis.

Species *H. floridanae* J. Ag. proxima, sed differt colore magis saturate violaceo-rubro, minus roseo, fronde magis dissecta, substantia firmiore, cortice crassiore, firmiore, saepe pleiostromatico.

[The BULLETIN for March (43: 117–168. pl. 4–6) was issued April 14, 1916.]

Ad oras Insularum Bermudensium (typum legit F. S. Collins, Apr. 25, 1912, no. 7074).

Thallus usually stipitate; stipe commonly 2–10 mm. long, 0.45–0.75 mm. thick, subterete below, complanate or costate-alate above, sometimes branched, occasionally more elongate and subrhizomatous; frond membranous, rather firm or slightly gelatinous, 60–120 μ thick, variable in form, suborbicular, cordate, or obovate, attaining a width of 4–30 cm., subentire, or sparingly or copiously lobed or proliferous, the lobes or proliferations conformable or ovate, themselves sometimes once or twice lobed in similar fashion, the proliferations often stipitate, the apices rounded-obtuse, the margins plane or more or less ruffled-plicate, subentire, lightly sinuate-crenate, or now and then irregularly coarsely or obscurely dentate; surface dull or rarely subnitent, smooth; color (dried) violet-red (rosolane-purple to Indian lake*); medulla of stipe compact, sometimes pseudoparenchymatous, 0.15–0.45 mm. thick; cortex of stipe or of its costa very firm, compact, parenchymatous, 8–30 cells thick, its cells in distinct anticlinal rows, cells of subcortex larger and irregularly disposed; medulla of frond moderately compact, its filaments mostly 3–8 μ in diameter, usually interspersed (in older parts at least) with coarser filaments, 6–20 μ in diameter, having more homogeneous refringent contents, such filaments radiating from substellate ganglion-like enlargements 15–65 μ in diameter; cortex of frond parenchymatous or subparenchymatous, 1–3 cells thick, the cells usually firm-walled, subquadrate in section, the superficial cells angular, mostly 5–10 μ in diameter in surface view, their outer walls 2–4 μ thick, protoplasts close (separated 2–3 μ), subcortex 1–3 cells thick, its cells mostly 13–25 μ in diameter; tetrasporangia 12–16 $\mu \times$ 8–10 μ ; cystocarps unknown.

BERMUDA: In shallow water in clefts of rocks and caves and among roots of *Rhizophora*; *A. F. Kemp*, August, 1856 (as *Rhodymenia palmata*); Walsingham, *W. G. Farlow*, February, 1881; near Hamilton, *M. A. Howe* 69, June 12, 1900; Stokes Bay, Tucker's Town, *M. A. Howe* 313, July 6, 1900; Harrington Sound, *A. B. Hervey*, January 15, 1913; Dingle Bay, *A. B. Hervey*, March 30, 1915; Grasmere, *A. B. Hervey*, March 9, 1914; Old Ferry, *A. B. Hervey*, April 2, 1913; Castle Harbor, *F. S. Collins*, April 25, 1912 (Phyc. Bor.-Am. 2050), and May 3, 1913.

TYPE: Castle Harbor, near Tucker's Town, April 25, 1912, *F. S. Collins* 7074, in herb. *F. S. Collins*.

* Ridgway, R. Color standards and color nomenclature *pl.* 26. 1912.

This species seems to be fairly common in Bermuda. Its favorite habitat is the walls of narrow deep clefts in the shore cliffs, such as are found between Tucker's Town and Walsingham. Here it grows from a little below low-water mark down at least to a depth of two or three meters, usually as single separate plants rather than in dense tufts. It seems to thrive best where much shaded. In an unattached condition it occurs also among mangrove roots, as in the vicinity of Hamilton. These loose fronds are darker in color, firmer in texture, and less adherent to paper when dried under pressure than are the attached forms. There is much variation in the form of the frond; the primary form seems to be orbicular and plane with a slightly developed stipe. Rapid marginal growth of the frond results in ruffles and plications, and when these are well developed the plant has somewhat the aspect of *Porphyra amplissima* in miniature. In color and habit it is often suggestive also of certain conditions of *Callymenia reniformis*, from which, however, it differs markedly in structure. Proliferous growth is common; the proliferations are sometimes sessile but are oftener stipitate, the stipe terete or flattened, in the latter case with or without an obvious costa, which may be continued into the base of the main expansion. In the older plants, under certain conditions of growth, the basal stipe, terete or flattened, may branch and form a matted subrhizomatous complex from which individual fronds arise, these usually orbicular or cuneate, or sometimes cordate from a cuneate base. An important character of this species is the presence, in the medulla, of conspicuous stellate ganglia more or less similar to those exhibited by the type specimen of *Halymenia floridana* J. Ag. and by *Sebdenia heteronema* M. A. Howe.* These may be easily observed through the cortex by transmitted reduced light under low-power lenses without the use of any staining reagents; however, their protoplasts have a peculiar affinity for haematoxylin stains and they may be differentiated with remarkable distinctness by overstaining with preparations of haematoxylin and afterwards partly decolorizing. The nodes of the ganglia are irregularly stellate or subglobose; from each of them radiate three to ten coarse rather rigid and straight tapering filaments with dense homogeneous refringent contents; in the

* Mem. Torrey Club 15: 163-165. pl. 58. 1914.

less developed conditions these radiating arms seem to lose themselves among the ordinary filaments of the medulla, but in older well-developed states some of these radiating arms may be traced directly to other ganglia, which thus form an interconnecting system. When a portion of the thallus is crushed on a glass slide and the other parts are reduced to a confused mass these ganglia and their rays often persist with little change. Septa in these enlarged specialized filaments are distant and irregularly placed. We have seen but few tetraspores and these were apparently not very well developed. Cystocarps have not been observed, although hundreds of specimens have been examined with the hope of finding them. In one lot of material, however, from Grasmere, we found small red spots resembling cystocarps under a hand lens, but these spots were apparently caused by the irritation of some endophyte or through injury by some small animal.

Halymenia bermudensis evidently finds its nearest ally in the little-known *H. floridana* J. Ag.,* with the type of which, as also with the Peruvian *Sebdenia heteronema* M. A. Howe,† it shows more or less agreement in having usually rather conspicuous sub-stellate medullary ganglia. It differs, however, from *H. floridana*, which is now known only from southern Florida and from near Beaufort, North Carolina (*W. D. Hoyt*), in its darker color (rosolane purple rather than pinkish vinaceous), in its commonly more lobed or dissected thallus, in its rather firmer texture, in its thicker, firmer, and less monostromatic cortex, and in its possible loss of sexual reproduction. Although, in a general way, the two species show a similarity in the medullary ganglia and the dimorphous medullary filaments, a critical comparison shows certain points of difference in these organs. The ganglia are less numerous, less conspicuous, and less obviously anastomosing in *H. bermudensis*. The arms on leaving the ganglion commonly taper away gradually, usually without a septum or obvious interruption of the protoplast; in *H. floridana*, the arms usually taper towards the ganglion and usually have a septum or a wide interruption of the protoplast near the place of emergence. As a result of these

* Anal. Alg. 59. 1892. Howe, Bull. Torrey Club 38: 511. 1911; Mem. Torrey Club 15: 164. 1914.

† Loc. cit.

peculiarities, the outline of the central node or ganglion in *H. bermudensis* is, when viewed through the cortex, more lobed, stellate, or brachiate, and less orbicular or rotate than in *H. floridana*.

J. Agardh founded *Halymenia floridana* on several specimens sent to him from Florida by Mrs. Floretta C. Curtiss, and he appears to have put certain specimens of the same thing, or of the typical thing, in the "*Kallymenia reniformis*" cover in his herbarium. Specimens of it, collected by A. H. Curtiss at Gilbert's Bar, Florida, were distributed by Curtiss with a printed "Algae Floridanae" label under the name "*Kallymenia reniformis* J. Ag.," from which plant it differs greatly in structure. *Halymenia floridana* and *H. bermudensis*, however, differ from typical *Halymenia* (*H. Floresia*) in their firmer subparenchymatous cortex, in their much firmer, non-deliquestent and scarcely gelatinous outer walls of the superficial cells, and in the striking development of the medullary ganglia. It is possible, as has already been hinted by one of us,* that more critical studies, especially of the development of the cystocarps (abundant in *H. floridana*), may furnish adequate grounds for the establishment of a new generic group which would include not only *Halymenia floridana* and *H. bermudensis* but also the Peruvian *Sebdenia heteronema*. J. Agardh placed *Halymenia floridana* in his section *Halarachnion* of the genus *Halymenia*, and De-Toni† has ranged it, with a question mark, under the generic name *Halarachnion*, but the type of *Halarachnion* (*H. ligulatum*) has no medullary ganglia comparable with those of *Halymenia floridana* and it differs also in the structure of the cortex.

Halymenia bermudensis may or may not adhere to paper when dried under pressure.

***Halymenia Gelinaria* sp. nov.**

Thallo roseo-vinaceo vel vinaceo-purpureo, brevi-stipitato; stipite a disco basali orto, inferne subtereti, superne cuneato; fronde plana, levi, nec nitente, membranacea vel subcarnosa, plerumque maxime gelatinosa, 60–600 μ crassa, suborbiculari, oblonga, ovata vel cuneato-obovata, latitudine 5 cm. usque 6 dm.,

* Howe, Mem. Torrey Club 15: 165. 1914.

† Syll. Alg. 4: 1655. 1905.

simplice vel parce subconformiter divisa, margine plana, integra vel irregulariter dentata aut crenulata, nonnunquam fimbriata; medulla frondis laxa vel subvacua, filamentis transversalibus crebris, filis stellatis paucis et inconspicuis; strato subcorticali dense filamentoso, filamentis anastomosantibus, cellulis nodalibus majoribus; strato corticali series 1-4 cellularum monstrante, parietibus cellularum mollissimis, gelatinoso-deliquestentibus; tetrasporangiis decussatim divisis; cystocarpiis numerosis, minutis, ad una pagina frondis plerumque prominulis, massa sporarum turbinata, 120-140 μ diam.

Species colore, habitu, cystocarpiorum forma, *H. floridanae* J. Ag. proxima, sed differt thallo multo magis gelatinoso, plerumque crassiore, cortice manifeste filamentoso, nec pseudoparenchymato, filis stellatis minus evolutis. Structura *H. Floresiae* (Clem.) Ag. similis, habitu differt, fronde latiore integra vel sub-integra, nec regulariter pinnata.

Ad oras Floridae et Carolinae Septentrionalis (typum legit M. A. Howe in loco "Jupiter Inlet" dicto ad oras Floridae, Oct, 13, 1902, no. 1252).

Thallus short-stipitate from a small basal disk; stipe 3-5 mm. long, 0.75-1.2 mm. thick, cuneate from a subterete base; frond plane, membranous or carnose-membranous, usually very gelatinous, 60-600* μ thick, suborbicular, oblong, ovate, or cuneate-obovate, attaining a width of 5 cm. to 6 dm., subentire or rather sparingly (usually conformably) parted, lobed, or proliferous, the margins entire or very irregularly lobulate, dentate, erose-crenulate, or occasionally laciniolate-fimbriate; surface dull, smooth; color pinkish vinaceous, rocellin-purple, vinaceous purple, or deep hellebore-red;† medulla of stipe 0.45-0.75 mm. thick, moderately compact, gelatinous; cortex of stipe gelatinous, mostly 8-15 cells thick; medulla of frond moderately compact or subvacuous, its filaments mostly 8-14 μ in diameter, many of them obliquely transverse, connecting the opposite subcortical layers, the cells mostly 20-70 μ long, the medulla occasionally showing a few rather inconspicuous stellate ganglia with nodes 20-40 μ in diameter and slender, elongate, rigid, straight or flexuous, now and then tortuous or nodulose, usually long-celled, radiating filaments, these commonly 4-7 μ in diameter, the ganglionic system with

* The minimum is drawn from the thinner parts of dried specimens, as shown when sections are soaked out with water; the maximum is from the older parts as shown in formalin-preserved material.

† Ridgway, loc. cit. *pl.* 27 and 38.

more homogeneous refringent protoplasts; cortex and subcortex of frond rather distinctly filamentous; subcortex consisting of a close network of anastomosing filaments, the stellately branched nodal cells mostly $13\text{--}20\ \mu$ in diameter; cortex 1–4 cells thick, the superficial cells (protoplasts) $3\text{--}10\ \mu$ in diameter in surface view, mostly obtuse and more or less isodiametric, sometimes broader than high, or, 1.5–2 times higher than broad and subacute, often segregated in groups of 2–8, their outer walls very gelatinous and deliquescent; tetrasporangia (protoplasts) $18\text{--}26\ \mu \times 13\ \mu$, the spores decussately paired; cystocarps numerous, minute, commonly slightly protuberant on one face, the spore-mass turbinate, $120\text{--}240\ \mu$ in diameter.

FLORIDA: Unattached, Jupiter Inlet, Mrs. G. A. Hall, September 14, 1896 (Phyc. Bor.-Am. 749b and 749c, as *H. floridana*); M. A. Howe 1252–1255, October 13, 1902; Indian River Inlet, Mrs. G. A. Hall, May, 1899 (Phyc. Bor.-Am. 749a, as *H. floridana*, and 750, as *H. floridana*, forma *dentata*); Key West, Mrs. G. A. Hall.

NORTH CAROLINA: Bogue Beach, Beaufort, W. D. Hoyt, August 12 and 16, 1907.

TYPE: Jupiter Inlet, Florida, October 13, 1902, M. A. Howe 1252, sheet C, in herb. N. Y. Botanical Garden.

The plant is known locally in the Jupiter Inlet region as the "beefsteak" seaweed. In form and color of the thallus, as well as in size and form of the cystocarps, *Halymenia Gelinaria* bears a remarkable resemblance to *H. floridana*; in fact, for two species that differ so much in the structure of the cortex, the similarity is astonishing. The affinities of *H. Gelinaria* are, however, clearly with *H. Floresia*, a species that it resembles much less in general habit. From *H. Floresia*, it differs chiefly in forming broad, entire or subentire membranes, which may reach a length or width of 60 cm., and in the less often acute, more isodiametric, superficial cells. *H. Floresia*, in typical forms, was found floating with it in Jupiter Inlet (Howe 1231) without intergrading conditions. When lobules, proliferations, or teeth occur in *H. Gelinaria*, they are very irregularly disposed, while in *H. Floresia* the branching is manifestly pinnate, or rather, bi-tri-pinnate. The main axes in *H. Floresia* may vary a good deal in width, but we have never seen them any broader than 7 cm. and they are rarely more than

2 or 3 cm. in width. From *Halymenia floridana*, *H. Gelinaria* differs in the much more gelatinous, often thicker, thallus, in the less firm, obviously filamentous rather than parenchymatous or subparenchymatous cortex, in the deliquescent outer walls of the superficial cells, in the longer cells of the medullary filaments, and in the comparatively rare and inconspicuous and differently shaped medullary ganglia. In *H. floridana* the freely anastomosing medullary ganglia are, with proper illumination or with differential staining* the most conspicuous anatomical feature of the thallus; their radiating branches are coarser than the ordinary medullary filaments and the ganglionic system looks like a sort of skeleton or framework about which the rest of the thallus has been filled in. In *H. Gelinaria*, small stellate cells, with ordinary unspecialized protoplasts are normal elements of the subcortex, but larger specialized stellate ganglia of the medulla with refringent protoplasts are rare or occasional and are not usually obvious without a special search; their radiating branches are commonly more slender than the ordinary medullary filaments among which they make their way; these branches rarely anastomose, commonly showing free ends, and they are, perhaps, rather more suggestive of medullary rhizoids than parts of a primary framework, yet they seem to differ from the medullary rhizoids of the Florideae in general in being straighter and more rigid, and in having denser more homogeneous refringent protoplasts. Medullary ganglia of a somewhat similar sort are of occasional occurrence in *H. Floresia* also. The difference between *H. Gelinaria* and *H. floridana* as to the character of the cortex comes out strongly when a section is made or even when a margin or a fold of the surface is examined microscopically; in *H. Gelinaria*, the dissolving away of the outer walls of the superficial cells leaves these cells more or less isolated and separate, so that the general surface appears minutely papillate, while in *H. floridana* under the same conditions the general surface is covered by a firm cuticle and is perfectly smooth. The cystocarps of *H. floridana* and *H. Gelinaria* appear to be very similar in form, size, and structure, but it is possible that an exhaustive study of the earlier stages of their development might reveal differences as marked

* See page 171.

as are shown by a microscopic comparison of the vegetative characters of these two superficially similar plants. The cystocarp of *H. floridana*, however, is commonly somewhat protuberant on both faces of the frond, while that of *H. Gelinaria* is commonly protuberant on only one face. In both, the spore-mass or "nucleus" is very dense, turbinate or oblate-spheroid, sometimes apparently two- or three-lobed, and is supported by a short stalk.

In 1900 (Phyc. Bor-Am. 750) the senior author of the present paper used the name "*Halymenia floridana* forma *dentata* (Crouan) Collins" for a dentate-margined condition of the present species, citing *Gelinaria dentata* Crouan in Mazé & Schramm, *Algues de Guadeloupe*, as a synonym. In doing this he was, in effect, adopting the opinion (expressed *in litt.*) of a distinguished phycologist who was familiar with the Guadeloupe specimens distributed by Mazé & Schramm but knew *Halymenia floridana* J. Ag. from description only. However, the Mazé, Alg. Guad. no. 1602, "Capesterre, Plage du bourg" in the herbarium of the British Museum, is certainly very different, as to species, at least, from either *H. floridana* or *H. Gelinaria*. Whatever may be the relation of other Guadeloupe specimens to these two species, the name *dentata* of Crouan, a "nomen seminudum" at best, can not, under the provisions of the "American Code" at least, be adopted for either, on account of the previously published *Halymenia dentata* Suhr.

Halymenia Gelinaria adheres very firmly to paper when dried under pressure.

***Halymenia pseudofloresia* sp. nov.**

Thallo violaceo-rubro, brevi-stipitata; stipite inferne subtereti, superne cuneato; fronde juvenili membranacea, gelatinosa, aetate provecta firmiore et subcoriacea, 50–450 μ crassa, circumscriptione suborbiculari, ovata, cuneato-obovata, vel nonnunquam valde irregulari, longitudine 7–30 cm., profunde lobata vel proliferationibus stipitatis munita; rachidibus 1–8 cm. latis, lobis et proliferationibus plerumque lanceolatis, serratis vel seriebus loborum etc. secundariorum munitis; superficie haud nitente, plerumque plana, sed aetate provecta minute verruculosa; medulla frondis laxa, subvacua, filamentis sparsis percursa, filamentis transversalibus crebris, filamentis stellatis paucis, inconspicuis; strato subcorticali indistincte filamentoso, cellulis 20–50 μ diam.; strato

corticali cellularum minorum 2-6 series monstrante, cellulis superficialibus aetate elongatis, obconicis vel clavato-truncatis, denique diametro plerumque 2-5-plo longioribus, parietibus externalibus gelatinosis, deliquescentibus; tetrasporangiis decussatim divisis; cystocarpis ignotis.

Ab *H. Floresia* (Clem.) Ag. et *H. Gelinaria* Collins & Howe differt colore magis saturate rubro vel violaceo-rubro, fronde denique firmiore, subcoriacea, nonnunquam verruculosa, cellulis terminalibus florum corticalium clavato-truncatis. Frons *H. pseudofloresiae* magis divisa est quam *H. Gelinariae*, minus et minus regulariter quam *H. Floresiae*.

Ad oras Insularum Bermudensium (typum legit A. B. Hervey, Jan. 15, 1915).

Thallus short-stipitate; stipe* 5-10 mm. long, 1-2 mm. thick, cuneate from a subterete base; frond membranous and gelatinous in younger parts, becoming firmer and subcoriaceous with age, 50-450 μ thick, suborbicular, ovate, cuneate-obovate, or commonly very irregular in general outline, attaining a length of 7-30 cm., deeply, irregularly, or subpalmately lobed, or often showing cuneate-based substipitate marginal proliferations, the main expansions or axes 1-8 cm. broad, the lobes or proliferations commonly lanceolate, serrate, biserrate, or subpinnately lobulate or bilobulate, the teeth mostly acuminate-deltoid; surface dull, mostly smooth, but often becoming rugose and minutely and copiously verruculose with age; color (when dried) daphne-red, becoming deep hellebore-red or neutral red† in old fronds; medulla of stipe 0.75-1.0 mm. thick, moderately compact; cortex of stipe rather firm, subparenchymatous, mostly 20-40 cells thick; medulla of frond mostly rather loose or subvacuous, its filaments 10-16 μ in diameter, many of them obliquely transverse, connecting the opposite subcortical layers, the cells 25-90 μ long, the medulla or inner subcortex occasionally showing a few inconspicuous stellate ganglia with nodes 20-40 μ in diameter and slender long-celled branches 2-5 μ in diameter; cortex and subcortex rather firm and solid, obscurely filamentous; cells of subcortex ellipsoidal, mostly 20-50 μ in diameter, obscurely anastomosing or concatenate; cortex 2-6 cells thick, the superficial cells (protoplasts) 4-13 μ in diameter in surface view, angular, obtuse, subisodiametric or often broader than high in younger parts, becoming columnar, obtuse, acute, or acuminate, and finally, for the most

* A well-developed original stipe has been seen in only one case.

† Ridgway, loc. cit., *pl.* 38.

part, obconic or clavate-truncate and 2-5 times higher than broad, their outer walls gelatinous or deliquescent; tetrasporangia (protoplasts) $14-26\ \mu \times 12-14\ \mu$, the spores decussately paired; cystocarps unknown.

BERMUDA: *W. G. Farlow*, 1881; Green Bay, *W. S. Wadsworth*, February, 1890; Castle Harbor, near Tucker's Town, *F. S. Collins* 7075, April 25, 1912; Walsingham, *A. B. Hervey*, January 15, 1915 (Phyc. Bor.-Am. 2099).

TYPE: Walsingham, *A. B. Hervey*, January 15, 1915, in herb. F. S. Collins.

Halymenia pseudofloresia differs from both *H. Floresia* and *H. Gelinaria* in its normally deeper red color, in the firmer subcoriaceous texture and verruculose surface of its older fronds, and in the mostly clavate-truncate and much elongate superficial cells of the older parts of its frond. From *H. Floresia*, which apparently occurs in southern Florida and the West Indies, as well as in the Mediterranean and adjacent regions, it differs also in the less deeply dissected frond, with the teeth or ultimate lobules mostly acuminate-deltoid from a broad base rather than mostly lanceolate, ligulate, or ciliiform from a somewhat constricted base. Lanceolate outgrowths from a narrowed base are of occasional occurrence, but such seem to have more the habit and nature of proliferations than of normal lobes and lobules. From *Halymenia Gelinaria*, *H. pseudofloresia* differs furthermore in its more lobed and dissected and more obviously pinnate frond and in its firmer, less distinctly filamentous cortex.

The older parts of *Halymenia pseudofloresia*, at least as shown in the Walsingham specimens collected by Hervey, are infested by four or five kinds of endophytic algae, and we have sometimes suspected that the small verrucae referred to in our description as occurring on the old fronds might be caused by irritation due to their presence. However, most of these verruculae appear to be free from any endophyte and we have thought best to treat them as more or less normal parts of the old frond. We have not observed any tendency of these verrucae of the general surface to develop into proliferations, even though the marginal proliferations commonly spring from somewhat similar outgrowths. These surface verruculae are dense, dark red, and about 0.2-

0.6 mm. in diameter, and to the naked eye they sometimes look a little as if they might be cystocarps. A filamentous short-celled Rhodophyceous endophyte sometimes forms dense subglobose or irregularly lobed glomeruli in the medulla and these also may have the superficial appearance of being cystocarps of the, *Halymenia*.

Halymenia pseudofloresia, like *H. bermudensis*, is commonly found in an unattached condition, and possibly the absence of cystocarps is in some way associated with this fact. The senior author has noted that *Delesseria sinuosa* and certain other membranaceous Rhodophyceae are commonly sterile when found in places where they have apparently been vegetating for some time unattached.

Specimens of *Halymenia pseudofloresia*, with occasional exceptions as to parts of the old fronds, adhere firmly to paper when dried under pressure.

***Halymenia echinophysa* sp. nov.**

Thallo pallido-vinaceo vel lilacino, membranaceo, gelatinoso, 125–200 μ crasso (madefacto), circumscriptione suborbiculari, 10–18 cm. diam., profunde, irregulariter vel subpalmatim lobato, lobis irregulariter obovatis vel suborbicularibus, marginibus sinuato- vel eroso-dentatis; medulla frondis subvacua vel laxe filamentosa, filamentis homogeneis, 10–14 μ diam.; strato corticali gelatinoso translucido, submonostromatico, cellulis superficialibus ovoideis, subglobosis vel ellipsoideis, 4–8 μ diam. max., 5–10 μ inter se distantibus, in membrana communi horizontaliter vel verticaliter positus, parietibus exterioribus (vel membrana superficiali extra-cellulari) 10–18 μ crassis; strato subcorticali 2–4-stromatico, cellulis arcte anastomosantibus, ovoideis, ellipsoideis, vel interdum complanatis, extimis 6–10 μ diam., intimis 25–65 μ diam. max., nonnullis subglobosis, 80–180 μ diam., echinato-stellatis, in medullam protrudentibus, processibus 15–40, subrigidis, subspinescentibus, munitis.

Species *H. actinophysae* M. A. Howe proxima, sed differt thallo minore, crassiore, magis lobato, non-nitente, membrana superficiali communi duplo crassiore, cellulis superficialibus inter se duplo distantioribus, filamentis medullaribus dimidio minus crassis et minus regulariter et minus manifesto capitatis in strato subcorticali abientibus, cellulis intimis strati subcorticalis saepe

multum majoribus, magis echinato-stellatis, cum processibus subspinescentibus saepe permultis.

Ad oras Insularum Bermudensium, in profundis (typo in herb. Hort. Reg. Kew., a Exped. "Challenger" lecto et "*Kallymenia reniformis*" denominato).

Frond membranous, gelatinous, 125–200 μ thick (when soaked out), suborbicular in general outline, attaining width of 10–18 cm., deeply, irregularly or subpalmately lobed or divided, the lobes irregularly obovate or suborbicular, mostly 2–6 cm. broad, their margins sinuate- or erose-dentate or sparingly sublobulate; surface dull; color (dried) light grayish vinaceous to Persian lilac;* medulla of frond subvacuous or loosely filamentous, its filaments homogeneous, mostly 10–14 μ in diameter (including gelatinous walls; protoplasts commonly only 1–4 μ); cortex of frond gelatinous, translucent, submonostromatic, the superficial cells (protoplasts) ovoid, subglobose, or ellipsoid, 4–8 μ in maximum diameter, widely spaced (separated 5–10 μ), their longer axes horizontal or vertical, their outer walls ("surface jelly") 10–18 μ thick; subcortex of 2–4 layers of closely anastomosing, ovoid, ellipsoid, or often flattened, thick-walled cells, the outer (protoplasts) granular, 6–10 μ in diameter, the inner mostly 25–65 μ in maximum diameter, some of the inner cells larger, subglobose, 80–180 μ in diameter, echinate-stelliform, projecting into the medullary cavity and showing when detached 15–40 rather rigid subspinescent processes, these mostly 25–60 μ long and 10–20 μ in diameter at base; other parts unknown.

BERMUDA: Dredged in "31 fathoms, off Bermuda" by members of the Challenger Expedition in 1873, and reported as "*Kallymenia reniformis* J. G. Agardh" (Rep. Voy. Challenger, Bot. 1: Bermudas 117. 1884). This is the only specimen known to the present writers.

TYPE: In the herbarium of the Royal Botanic Gardens, Kew, England.

Halymenia echinophysa appears to find its nearest ally in *H. actinophysa* M. A. Howe,† from La Paz, Lower California, but differs in the smaller, thicker, more lobed, non-nitent thallus, with the surface jelly twice as thick, the surface cells twice as widely spaced, the medullary filaments one half as stout, in the less regularly and less obviously capitate terminations of these

* Ridgway, loc. cit. *pl.* 38, 39.

† Bull. Torrey Club 38: 509. *pl.* 34. 1911.

filaments in the subcortex, and in the often much larger, more numerous and more echinately branched stelliform cells of the inner subcortex.

From *H. bermudensis* Collins & Howe, to certain forms of which it bears a superficial resemblance, it differs in being much more gelatinous, in the much thicker surface jelly or outer walls of the superficial cells (10–18 μ vs. 2–4 μ thick), in the more generally monostromatic cortex, in the more widely spaced (5–10 μ vs. 2–3 μ) protoplasts of the superficial cells, in having a medulla that is filamentous and homogeneous instead of showing a system of substellate ganglia with refringent specialized protoplasts, and in the presence in the inner subcortex of cells that are 80–180 μ in diameter with 15–40 subspinescent processes, while the inner cells of the subcortex of *H. bermudensis* are 13–25 μ in diameter and have no obvious appendages.

When the enlarged echinate-stelliform cells of the inner cortex are detached, some of their numerous sharp-pointed processes show apices that look as if they had been free from all cell connections, but most of them show at the apex traces of a septum to which they have narrowed down and at which point they have been disjoined from their former cell connections. The protoplasts of these large echinate cells are similar to those of their neighbors or are more vacuous, wherein they differ greatly from the substellate medullary ganglia of *H. bermudensis* and *H. floridana*, the protoplasts of which are conspicuously different from those of the ordinary cells in being denser, more homogeneous, and more refringent. As is the case in *H. actinophysa*, the cells of the subcortex of *H. echinophysa* are so gelatinous and translucent that their form and relations can not well be ascertained without resort to staining reagents, such as solutions of haematoxylin.

Of the four species above described, specimens of three, *Halymenia Gelinaria*, *H. pseudofloresia*, and *H. bermudensis*, have already been distributed in the Phycotheca Boreali-Americana of Collins, Holden & Setchell, as indicated. This will, we trust, in a measure atone for the lack of illustrations in the present paper.